Mining Activities and it's Impact on Landuse and Livelihood- A Geographical Study of Bokaro Coal Belt

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NAME OF THE CANDIDATE:

Ajay Gope

UGC NET-JRF

Research Scholar

Ranchi University , Ranchi

NAME OF THE SUPERVISOR:

Dr. Debjani Roy

Asst. Professor & Head

P. G Department of Geography

Nirmala College, Ranchi

Topic Name: Mining Activities and it's Impact on Landuse and Livelihood- A Geographical Study of Bokaro Coal Belt

Name of the candidate: Ajay Gope

Address : Mohanpur , Barmasia , Bokaro pin code: 828134

Gmail: ajaygope7739@gmail.com

Mobile no: 6205060411

Name of the Supervisor: Dr. Debjani Roy

Address: Head, PG Dept. of Geography, Nirmala College Ranchi – 834002

Email Id: debjaniroy696@gmail.com

Mobile No: 9973726140

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INTRODUCTION

Land use refers to human activities and the different purposes for which land is utilized[3]. Mining is a important economic activity that supports the industrial growth and energy demands worldwide. Bokaro, being part of the Gondwana region and shaped by various geological processes, is home to a significant number of coal fields. So, the Bokaro coal belt is a important coal mining region, have extensive reserves and supporting the livelihoods of numerous communities. While mining activities have caused employment, revenue, and infrastructure development. The rapid expension of mining activities have also led to significant land use changes, agricultural land loss, deforestation and displacement of local population. The extraction of natural resources is inherently linked to changes in land use and land cover[3].

This study aims to examine the intricate relationship between mining activities and their impacts on the land use and livelihoods in the Bokaro coal belt. It will also explore how mining has transformed land use patterns, affected forest and agricultural lands, and influenced the socio-economic fabric of local communities. By investigating these dynamics, the study will provide valuable insights into the challenges of balancing economic growth with environmental sustainability and social equity. The findings of this study will inform policymakers, stakeholders, and local communities, contributing to strategies that ensure mining activities align with sustainable development goals while minimizing adverse impacts on people and the environment.

STATE OF THE ART

Kumar, A., & Pandey, A.C. (2013) in his study examines the spatio-temporal changes in land use and land cover in the South Karanpura coal mining region and its surrounding areas from 1992 to 2009. The findings highlight an initial expansion of the coal mining area, which was later followed by a reduction due to the depletion of coal reserves and a subsequent decline in coal production. These changes in land use, driven by coal mining activities, primarily occurred at the expense of cropland.[1]

Dhar, S.B., & Dutta, M. (2020) in his study focuses on the significant impact of opencast coal mining on land use and land cover patterns in colliery regions. It examines various land-use categories, including built-up areas, cropland, vegetation, water bodies, bare land, and mining zones. The research analyzes changes in land use and land cover within the Mangalpur private opencast colliery. The findings reveal a notable expansion in mining and bare land areas, accompanied by a substantial decline in cropland and vegetation cover during

the study period. To promote the sustainable use of land in the region, several management strategies have been proposed in the concluding section.[2]

Prakash, A., & Gupta, R. (1998) in his study examines land use changes in the Jharia coalfield region, where extensive and ongoing underground and opencast mining activities have made land-use analysis critically important. The research highlights the application of remote sensing and GIS techniques for identifying various land-use categories through satellite imagery and enhanced products, as well as for tracking temporal changes in land-use patterns. The identified land-use classes, based on satellite data and field surveys, include dense vegetation, sparse vegetation, active fires, opencast mining areas, overburden dumps, subsidence zones, barren wastelands, settlements, transportation networks, rivers, and water ponds.[3]

Singh, A.K., & Singh, Y.K. (2022) conducted a study in Dhanbad district and observed that mining activities have brought significant socio-economic changes to the region. These include the creation of employment opportunities, improved access to education and healthcare, enhanced transportation facilities, the development of new infrastructure, and efforts to alleviate poverty in the mining areas. The study also revealed that mining has contributed to societal modernization, influencing the mindset of residents. People in the mining regions are moving away from traditional cultural practices and embracing new ideas and technologies. Furthermore, the traditional rural community structures in the area have diminished over time.[4]

Pandey, M.(2022) in his study found that the growing energy demand from domestic and industrial sectors has led to an increase in coal production through intensive mining of existing reserves, along with the exploration of potential mining areas across the country. This has resulted in significant land use and land cover changes, which have adversely impacted the soil quality of the affected regions.[5]

Chitade, A.Z., & Katyar, S. (2010) in his study examines the effects of opencast coal mining on land use and land cover (LULC) changes in the Wardha basin of Chandrapur district, India, utilizing remote sensing and GIS techniques. The region has undergone significant LULC transformations due to coal mineral extraction, which has also led to notable environmental impacts.[6]

Setu, P(2024) The socio-economic aspects of coal mining in India present a multifaceted interplay of livelihoods and economic interdependencies. This article seeks to examine the extent of household dependence on coal-related livelihoods. The findings reveal a significant clustering of coal-based livelihoods within a 5 km radius of active mining sites. Additionally, about half of the households across various distance strata rely on incomes from casual labor. [7]

Noy, I. (2019) This thesis explores the diverse ways in which mining industrialization has influenced various groups within rural communities, ranging from informal coal traders to colliery workers, and examines its broader impact on the community. By delving into their lives, livelihoods, and viewpoints, the study challenges conventional notions about the

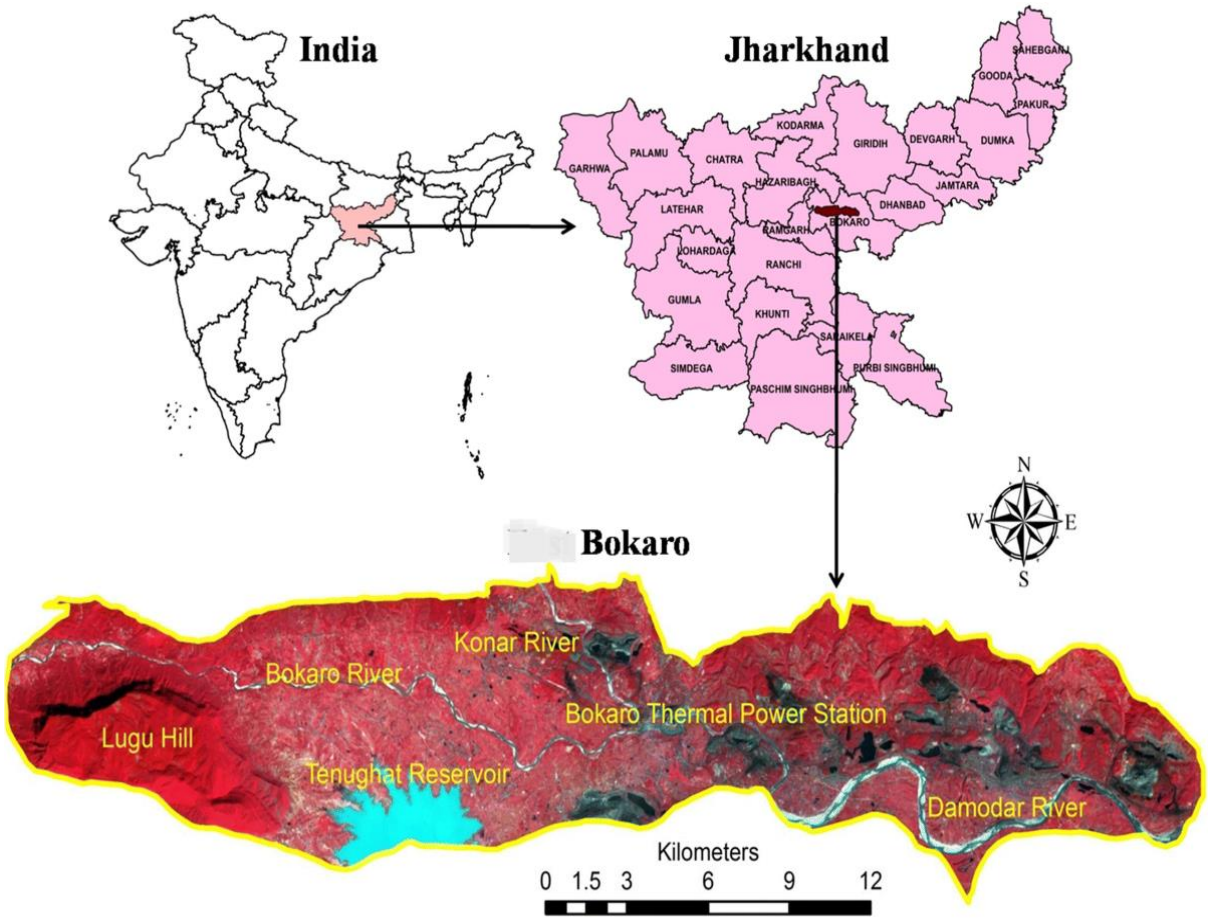
consequences of mining and displacement. It also contributes to ongoing discussions on labor and politics. Contrary to dominant critical theories of dispossession, the thesis highlights that dispossession does not merely result in the destruction of rural communities but often drives socioeconomic differentiation within them, exacerbating internal inequalities.[8]

Adhikary, T., Bhattacharji, M., & Ghosh, A. K. (2014) In this research paper author attempt to study the various aspects of Quality of Life from socioeconomic perspective in coal field region of jharia of dhanbad district. It found that the quality of live vary from place to place and from time to time. Due to long time mining and unscientific mining practices several parts of the coalfield have become vulnerable not only for the miners but also for the resident population[9]

Goswami, **S. (2013)** in his paper examines the impact of coal mining in the Jharia Coalfield region of Dhanbad district. It highlights that coal mining affects the socio-economic and environmental aspects of the area at every stage. During mining, the region experiences specific socio-economic and environmental challenges, while post-mining, these impacts differ significantly. Additionally, the lack of proper resettlement efforts after mining has disrupted the region's social structure.[10]

Kumar, Singh. (2020) in his study indicates that mining activities in the East Bokaro coalfields have caused substantial changes in land use, leading to a decline in forest cover and agricultural areas, while contributing to an increase in settlements and barren land. Agriculture and mining are recognized as the key factors driving these landscape transformations.[11]

STUDY AREA



Source: Upgupta, S., Singh, P.K. Quantifying the Dynamics and Drivers of Landscape Change in an Opencast Coal Mining Area of Central India (East Bokaro, Jharkhand). *Proc. Natl. Acad. Sci., India, Sect. A Phys. Sci.* **90**, 565–577 (2020). https://doi.org/10.1007/s40010-018-0589-0

Bokaro district, one of the most industrialized regions in India, is situated between latitudes 23°24'34" N and 23°59'05" N, and longitudes 85°35'00" E and 86°38'47" E, covering an area of 2,821 square kilometers. Established in 1991, the district was formed by carving out one subdivision with two blocks from Dhanbad district and six blocks from Giridih district.

Climate

Bokaro district lies in the tropical monsoon region, experiencing a tropical climate. The region witnesses three main seasons: winter, summer, and monsoon. Winters are dry and cold, with temperatures ranging from a maximum of around 28°C to a minimum of 4°C–6°C. Summers are hot and humid, with maximum temperatures exceeding 42°C. The monsoon season brings heavy rainfall, with annual precipitation ranging between 157 cm and 195 cm, making the weather more pleasant.

Demographic Characteristics

As per the 2011 Census, Bokaro district has a population of 2,062,330, with a population density of 716 inhabitants per square kilometer. Between 2001 and 2011, the district's population grew by 15.99%. The sex ratio stands at 916 females per 1,000 males, and the literacy rate is 72.01%. About 47.70% of the population resides in urban areas. Scheduled Castes and Scheduled Tribes constitute 14.51% and 12.40% of the population, respectively[13].

Major Coalfields

Bokaro's key coalfield areas include Jarangdih, Kathara, Swang, Gomia, Kargali, Sawang, Petarwar, Chas, Pichri, and Bermo

OBJECTIVE

1. To analyze the relation between mining activities and changes in land use patterns in the Bokaro coal belt.
2. To evaluate the relationship between the expansion of mining activities and infrastructure of the region
3. To assess the extent to which increased mining activities have contributed to industrialization, and changes in livelihood pattern of the people.
4. To examine the effect of mining on the socio economic condition of the people.
5. To assess the role of government policies and corporate social responsibility initiatives in safeguarding the rights and livelihoods of affected people

PROBLEM TO BE INVESTIGATED

1. How do mining activities influence changes in land use patterns in the Bokaro mining area?
2. How has mining activities affected the infrastructure of the region?
3. How has the increase in mining activities and subsequent industrialization affected the livelihood of the people?
4. How has mining affected the socio economic condition of the people of this area?
5. How have government policies and corporate social responsibility initiatives helped in in safeguarding the rights and livelihood of affected people?

HYPOTHESIS

1. Mining activities significantly influence land use changes in the Bokaro coal belt.
2. Mining activities are strongly correlated with the reduction of infrastructure in the region.
3. The expansion of mining activities and subsequent industrialization has not affected the livelihood pattern of the people.
4. Increased mining activities have improved socio economic conditions of the people.
5. Government initiatives and corporate social responsibility has affected the life of local residents.

RESEARCH DESIGN AND METHODOLOGY AND MATERIAL

Methodology for the first objective:

- **Data Collection:**
  - Satellite images (e.g., Landsat, Sentinel) will be used to analyze land use changes over a last two decade.
  - Mining activity data , such as area under mining, production levels, and timelines will be used.
- **Tools & Techniques:**
  - GIS and Remote Sensing will be use for spatial and temporal analysis.
  - Statistical techniques (e.g., Pearson correlation) will be used to measure the relationship between mining activities and land use changes.

Methodology for the second objective:

- **Data Collection:**
  - Satellite imagery will be used to assess forest and agricultural land cover changes.
- **Tools & Techniques:**
  - Change detection analysis will be done by using GIS and Remote Sensing to quantify the reduction in forest and agricultural land.

Methodology for the third objective:

- **Data Collection:**
  - Secondary data on infrastructure (roads, schools, hospitals) from government reports and company records.
- **Tools & Techniques:**
  - Statistical analysis (e.g., regression analysis) to evaluate the relationship between mining expansion and infrastructure conditions.

Methodology for the fourth objective

- **Data Collection:**
  - Primary data will be collected through the household surveys to assess indicators like income, education, health, and employment.
  - Secondary data from government reports.
- **Tools & Techniques:**
  - Questionnaires will be used to measure perceptions of improved living conditions.
  - Statistical analysis (e.g., t-tests or ANOVA)

Sampling:

Use stratified random sampling will be used to ensure representation of different population groups (e.g., miners, displaced people)

TENTATIVE CHAPTER SCHEME

Introduction

- Chapter -1: Physical Layout and Socio-Economic characteristic of Bokaro Mining region.
- Chapter- 2 : Origin and Development of the Mining in Study area.
- Chapter -3 : Mining Activities and Land Use Changes .
- Chapter- 4 : Impact of Mining Activities on Local Infrastructure.
- Chapter- 5 : Impact of Mining on Industrialization and livelihood.
- Chapter- 6 : Impact of Mining on Socio-Economic condition of people.
- Chapter-7 : Government policies, Corporate Social Responsibility and it's Impact on Mining area.

Conclusion
Bibliography

SIGNIFICANCE OF THE STUDY

1. **Understanding Land Use Dynamics:**
   This study will examine the spatial and temporal changes in land use patterns resulting from mining activities. It will specifically assess the extent of deforestation, loss of agricultural land, and land degradation caused by mining.
2. **Impact on Livelihoods:**
   The research will shed light on the socio-economic impacts of mining on local communities, with a particular focus on the livelihoods of displaced populations.
3. **Infrastructure and Development:**
   The study will evaluate the effects of mining activities on local infrastructure, determining whether mining-driven development is inclusive and equitable for the affected regions.
4. **Sustainability and Policy Implications:**
   This research will enhance the understanding of sustainable mining practices, helping to balance economic growth with environmental and social considerations.
5. **Environmental Conservation and Resource Management:**
   The study will emphasize the importance of sustainable resource management to ensure that mining activities do not lead to irreversible damage to natural ecosystems

ITS RELEVANCE TO THE PRESENT DAY PROBLEM AND NEED TO THE SOCIETY

It will help in Addressing Land Use Conflicts, Livelihood Protection Infrastructure,Development Promoting Sustainability, Natural Resource Conservation, Natural Resource, Conservation Climate Impact Mitigation.This research will also help in policy making

CONTRIBUTION TO THE EXISTING KNOWLEDGE

- Advancing Land Use Research
- Understanding Socio-Economic Impacts
- Infrastructure Development and Equity
- Sustainability of Mining Practices
- Environmental Resource Management

FUTURE WORK

1. Conduct long-term research to monitor and assess the ongoing impacts of mining activities on land use, livelihoods, and local infrastructure over time.
2. Assess the role of advanced mining technologies in reducing environmental degradation and improving socio-economic outcomes.
3. Investigate the role of mining activities in contributing to climate change and explore strategies for building climate resilience in mining-affected communities.

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